Wind and Seismic Effects

Proceedings of the 30th Joint Meeting

NIST SP 931

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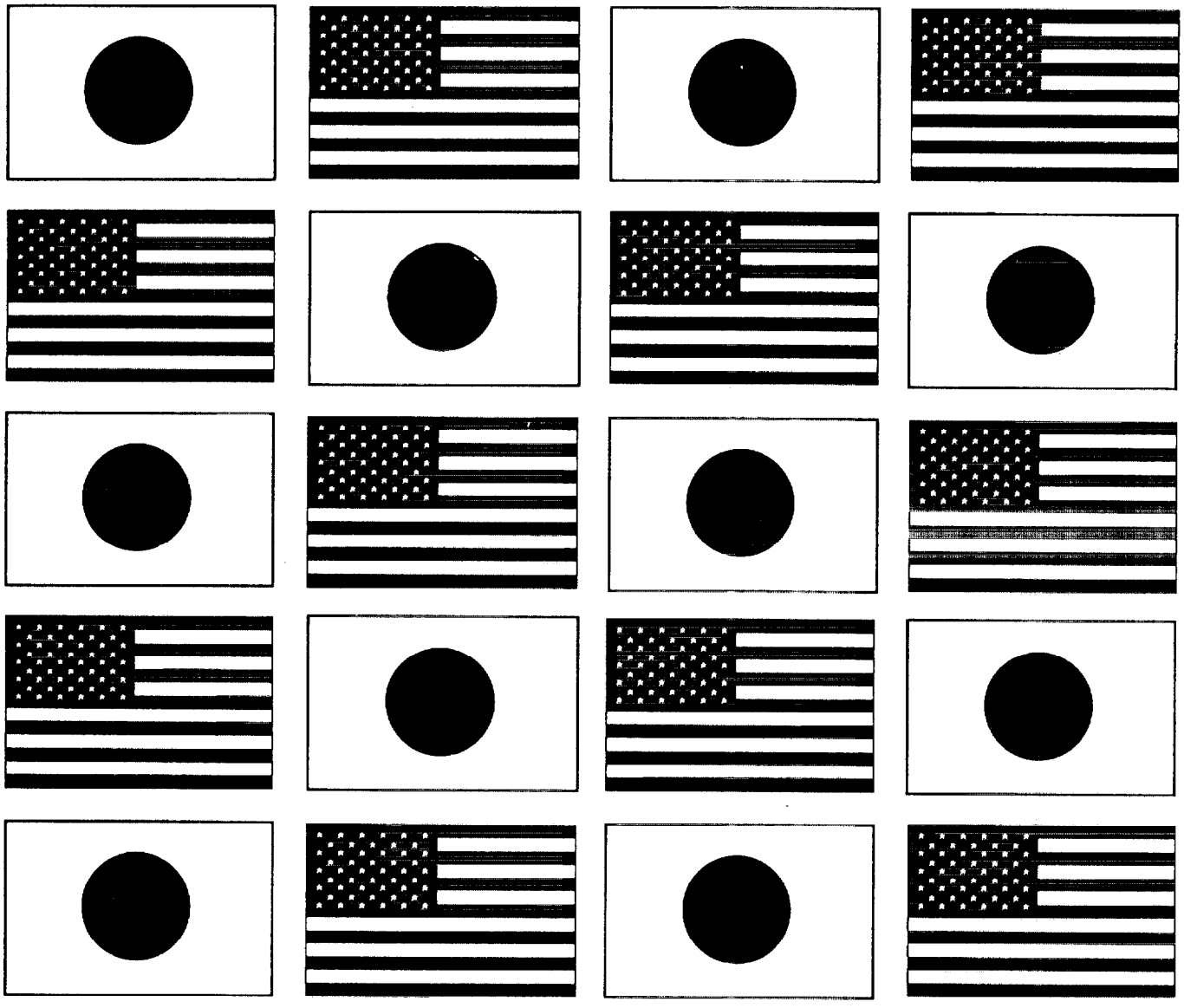

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PROCEEDINGS OF
THE 30TH JOINT
MEETING OF
THE U.S.-JAPAN
COOPERATIVE PROGRAM
IN NATURAL RESOURCES
PANEL ON WIND AND
SEISMIC EFFECTS

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PREFACE

This publication contains the Proceedings of the 30th Joint Meeting of the U.S.-Japan Panel on Wind and Seismic Effects. The meeting was held at the National Institute of Standards and Technology in Gaithersburg, Maryland during 12-15 May 1998. Fourty-five papers were written, 22 by U.S. members and 23 by Japanese members. Thirty-eight papers were presented orally; 20 by the U.S.-side and 19 by the Japan-side. They were organized around seven themes: 1. Special Session in Celebration of the Panel's 30th Anniversary, 2. Storm Surge and Tsunamis, 3. Earthquake Engineering, 4. Joint Cooperative Research Programs, 5. Real Time Information Acquisition and Dissemination, 6. Wind Engineering, and 7. Reviews of the Panel's 11-Task Committee Activities and Highlights of Recent Task Committee Workshops. Eighteen Japan-side and 32-U.S.-side experts participated in these meetings

Two papers were presented at a mini-symposia conducted at USGS in Golden, CO during the technical site visit segment of the Joint Panel Meeting. The Japan-side paper is included in these proceedings in the section, Manuscripts Presented at Mini-Symposium.

BACKGROUND

Responding to the need for improved engineering and scientific practices through exchange of technical data and information, research personnel, and research equipment, the United States and Japan in 1961 created the U.S.-Japan Cooperative Science Program. Three collateral programs comprise the Cooperative Science Program. The U.S.-Japan Cooperative Program in Natural Resources (UJNR), one of the three, was created in January 1964. The objective of UJNR is to exchange information on research results and exchange scientists and engineers in the area of natural resources for the benefit of both countries. UJNR is composed of 18 Panels each responsible for specific technical subjects.

The Panel on Wind and Seismic Effects was established in 1969. Nineteen U.S. and seven Japanese agencies participate with representatives of private sector organizations to develop and exchange technologies aimed at reducing damages from high winds, earthquakes, storm surge, and tsunamis. This work is produced through collaboration between U.S. and Japanese member researchers working in 11 task committees. Each committee focuses on specific technical issues, e.g., earthquake strong motion data. The Panel provides the vehicle to exchange technical data and information on design and construction of civil engineering lifelines, buildings, and water front structures, and to exchange high wind and seismic measurement records. Annual meetings alternate between Japan and the United States (odd numbered years in Japan; even numbered years in the United States). These one-week technical meetings provide the forum to discuss ongoing research and research results; one-week technical study tours follow the meetings.

The National Institute of Standards and Technology (NIST) provides the U.S.-side chair and secretariat. The Public Works Research Institute (PWRI), Japan, provides the Japan Side chair and secretariat.

Cooperative research is done through formal Panel Programs. In 1981, cooperative research in Large-Scale Testing was started under the auspices of the Panel. Also, in 1981, joint research on Reinforced Concrete Structures was initiated. Full-scale testing was performed at the Building Research Institute (BRI), one of the six Japanese members' organizations, with supporting tests in Japan and in the United States Two years later, a joint research program on Steel Structures was initiated. Full-scale testing again was led by BRI with supporting tests in the United States and Japan. The U.S.-Japan coordinated program

for Masonry Building Research was started in 1985. A U.S.-Japan coordinated program on Precast Seismic Structural Systems was initiated in 1991. A joint program on Seismic Performance of Composite and Hybrid Structures was initiated in 1993. In 1994, a joint program was started on Physical and Numerical Simulation of Structural Damages Due to Liquefaction and Development of Countermeasure Techniques.

Task Committee meetings, exchanges of data and information through technical presentations at annual Panel meetings, exchanges of guest researchers, visits to respective research laboratories and informal interactions between Panel meetings, joint workshops and seminars, and joint cooperative research programs all contribute to the development and effective delivery of knowledge that has influenced design and construction practices in both countries. Guest research exchanges have advanced the state of technology in areas of steel, concrete, and masonry structures under seismic forces; developed techniques to analyze risks from liquefaction; modeled water seepage in dam foundations; performed comparative analyses of seismic design of U.S. and Japanese bridges.

Direct communication between counterpart country organizations is the cornerstone of the Panel. Effective information exchanges and exchanges of personnel and equipment have strengthened domestic programs of both countries. There are opportunities for experts in various technical fields to get to know their foreign counterparts, conduct informal exchanges, bring their respective views to the frontiers of knowledge, and advance knowledge of their specialties.

The Panel's activities resulted in improved building and bridge standards and codes and design and construction practices in hydraulic structures in both countries, for example:

- created and exchanged digitized earthquake records used as the basis of design and research for Japan and the United States;
- transferred earthquake engineering information and strong-motion measurement techniques for use by seismically active countries, e.g., Australia, Canada, Italy, Mexico, Peru, Taiwan, Turkey, and North Africa;
- produced data that advanced retrofit techniques for bridge structures;
- developed field test data for use in aerodynamic retrofit of bridge structures;
- produced full-scale test data that advanced seismic design standards for buildings;
- advanced technology for repairing and strengthening reinforced concrete, steel, and masonry structures;
- improved *in-situ* measurement methods for soil liquefaction and stability under seismic loads;
- created a database comparing Japanese and U.S. standard penetration tests to improve prediction of soil liquefaction;
- created a database on storm surge and tsunamis and verified mathematical models of tsunami and storm surge warning systems;
- established a library resource of current research on wind and earthquake engineering and on storm surge and tsunamis;
- published proceedings of Panel meetings, Task Committee Workshops, and special publications such as List of Panel Publications and translated two-volume series on earthquake resistant construction using base isolation systems;
- gained better knowledge of both countries' research, design, and construction capabilities from in-depth visits to the host country's laboratories and building and public work projects. Results of such visits contribute to creation of new Task Committees, agendas for Joint Panel meetings and

task committee workshops, visits of U.S.-Japan researchers, and joint collaborative research.

HIGHLIGHTS OF THE JOINT TECHNICAL MEETING, 12-15 MAY 1998

The Panel celebrated its 30th joint meeting under the Theme, *Wind and Seismic Effects for the New Millennium*.

- Technical presentations highlighted important work by the U.S. and Japan Panel:
  - software emphasis for mitigation—beyond more resistant structures to emergency practices and national land management,
  - completing our Panel's work—more attention is needed for mitigation incentives and a focused 20-year effort to provide those technologies that will end disasters,
  - good correlations produced for real time component tests with systems simulation,
  - construction of a 20 m x 15 m, 1200 ton full-scale Japanese 3-D shake table test facility by 2005,
  - modeling long period surface waves at boundaries of deep sedimentary basins,
  - important surface wave effects for long period sea floor motions,
  - opportunities for systematic modeling of earthquake response of dams,
  - design and retrofit criteria for welded steel moment frames,
  - seismic isolation materials and systems for buried structures,
  - framework for performance-based design of buildings,
  - bases for major revisions of highway bridge design criteria,
  - physical and mental health of disaster survivors and disaster responders,
  - broad range of complementary work in developing disaster information systems; they should be distributed, open, and integrated with normal operating systems,
  - systematic use of Deer Island bridge to develop and improve models for wind response of bridges,
  - Japanese are developing new technologies and new design concepts for next generation of record long span bridges (2700 m) in earthquakes and typhoon areas,
  - practical, rational techniques for increasing wind and seismic resistance of housing.
  - new seismic design guidelines for concrete filled tubes, R/C column to steel beam systems, concrete core with exterior steel frame (hybrid wall system).
  - new technologies in GPS application and geospatial analysis to mitigate disasters.

- Panel Task Committee (T/C) activities grow in strength. The Panel created a new T/C on Seismic Information Systems to adapt information technology to reducing earthquake losses and two T/Cs were consolidated to better focus on intelligent structures. Interest was evident to pursue joint work in public health issues resulting from natural disasters. The T/C structure is an effective vehicle to explore in depth modern seismic and wind technologies being used by both countries. Four T/C workshops/conferences were held in the past year; ten workshops and joint meetings are planned for the coming year.

- The UJNR Panels on Wind and Seismic Effects, Fire Research and Safety, and Earthquake Research are contributing to the U.S./Japan Natural Disaster Reduction Effort of the Common Agenda.

- The Panel's newsletter is effective in disseminating its information. The Panel's Web Site is considered useful in deploying information to Japan and U.S. design and construction organizations. NIST will continue to maintain the Web Site during the next year. The site is available at http://www.bfrl.nist.gov/info/ujnr

HIGHLIGHTS OF THE TECHNICAL SITE VISITS 11 AND 16-21 MAY 1998

During the 30th Joint meeting of the Panel on Wind and Seismic Effects the delegation visited ten technical sites in the greater Washington, DC, Denver, and San Francisco metropolitan areas. Fourteen, eight, and nine Japan members participated in these site visits, respectively.

1. **U.S. Army Topographic Engineering Center** (www.tec.army.mil/tec_mission.html).
Dr. William Roper, Director, Topographic Engineering Center (TEC), Panel co-chair of Task Committee "G" Seismic Information Systems, hosted the delegation. TEC supports the Army in developing terrain visualization models, computer image generation, 3-D graphics, distributed interactive simulation, precision surveying and mapping; global positioning system (GPS) development; image analysis; geographic information systems (GIS); data/image fusion and virtual reality modeling of the environment. TEC is developing capabilities to model human interactions with the environment and model environmental restoration and conservation.

Two TEC staff demonstrated enhanced environmental and terrain capabilities for distributed interactive simulations and discussed TEC's development of 3-D visualization capabilities to demonstrate virtual reality environments. In artificial intelligence for terrain analysis, TEC is developing R&D methods for automated terrain reasoning to support modeling and simulation of environmental impacts from burning, smoke flow, droughts, and hazardous wastes.

TEC staff have developed large data bases of geological, vegetation, and atmospheric spectral signatures (visible, thermal, fluorescence). Thermal infrared reflectance spectra reveal high spectral resolution information about the geological and vegetation components on the surface of the earth and the atmosphere. Radar images too are used to develop images of areas obscured by clouds to interpret the image beneath.

Of particular interest to the Panel is TEC's DrawLand. This software, developed by TEC, visualizes terrain data. It behaves like a flight simulator; what is seen on the monitor changes in response to how one manipulates the controls of a virtual vehicle. DrawLand reads from CD Roms; raster map data can be draped to create the appearance of a 3-D map. DrawLand has used imagery from sources such as Landsat, SPOT, and aerial photography. TEC developed this capability in 1994 with 10 m accuracy. Resolution capabilities of 2 m to 3 m accuracy exist to measure tides, map topography, and to determine elevation data surface water flow.

The Panel will benefit by having access to these capabilities in appropriate work such as its new Task Committee on Seismic Information Systems. Simulations of the built environment may be performed using data from topographic maps to model damages caused by fires and tsunamis following earthquakes or damages from earthquakes and high winds to the built environment.

TEC is one of four laboratories of the U.S. Army Corps of Engineers. It is located in Alexandria, VA and employs about 600 staff operating with a $120 million budget.

2. **National Building Museum** (www.nbm.org/intro.htm). The delegation visited the 1887 Pension Building (now the National Building Museum) designed by Montgomery C. Meigs, who was Quartermaster General in charge of provisions during the Civil War. The building was constructed to serve as the government office for disbursing government checks to Civil War veterans and to their widows. Later, it was occupied by a variety of Government agencies. Created by an act of Congress in 1985, the building was designated the National Building Museum to serve as a focal point for permanent and temporary exhibitions; resource for collecting artifacts of design and construction; publisher of books and journals, and offers a variety of programs ranging from workshops on building crafts to tours of landmark buildings and construction sites, as well as films, lectures, concert series, and symposia.

The delegation visited one of the many exhibits, *Breaking Through the Creative Engineer*. This exhibit explores how creativity is expressed through the work of modern engineers. Its focus is on the creative impulse of the people who strive to give shape to the material world, built environment, and systems of information and power. Case studies in the exhibition are intended to stimulate reflection about the kind of thinking that allows an engineer to break through the ordinary and give birth to something novel. The displays are organized around eight themes that suggest some elements of engineering creativity and creativity in other areas of life: challenging, connecting, visualizing, collaborating, harmonizing, improvising, reorienting, and synthesizing.

Some interesting statistics about the Washington, DC National Building Museum reveals the original construction cost was $887,000. It is 122 m by 111 m, 23 m to cornice level; constructed of 15,500,000 bricks with brick and terra cotta ornament; its terra cotta exterior frieze is 366 m long and 0.9 m high representing a continuous parade of Civil War military units. The Great Hall measures 96 m by 35 m and is 48 m at its highest point. Its Corinthian columns are among the tallest interior columns in the world measuring 23 m high; 2.4 m in diameter; 7.6 m in circumference each made of 70,000 bricks and painted to resemble Sienna marble. There are 72 ground floor Doric-style columns (terra cotta covered with cement) and 72 second floor Ionic-style columns (cast iron). Two hundred forty four busts reside in niches high above the center court that represent members of building occupations. A clever system of windows, vents, and open archways provided complete air circulation throughout the building; cooling in the summer and heating in the winter.

3. **Colorado State University, Fluid Dynamics and Diffusion Laboratory** (http://www.lance.colostate.edu/depts/ce/netscape/depts/fluid_mechanics/faculty.html). Professor Robert Meroney, Director, Fluid Dynamics and Diffusion Laboratory (FDDL) and staff hosted the delegation to discuss fluid mechanics and wind engineering research performed at FDDL. Professor Meroney reviewed work performed by the boundary-layer wind tunnels used in support of fundamental investigations of turbulence and turbulent diffusion. Research centers on wind engineering and wind effects on buildings and structures including low-speed turbulent flow, atmospheric flow near the earth's surface and around bluff bodies; computational fluid mechanics; physical modeling of the atmospheric boundary layer and flow phenomena within this layer; and wind tunnel testing of environmental design for urban centers and air-pollution control.

Dr. Jack Cermak, University Distinguished Professor and founder of FDDL, reviewed wind research developed during the last three decades. Professor Cermak noted a variety of laboratory investigations performed by FDDL. They include wind forces on proposed tall buildings and long-span bridges, wind forces on low-rise buildings, atmospheric diffusion near energy producing and storage facilities, and other

wind engineering projects. Wind research is performed for sponsors from consulting firms, research institutes and industrial firms throughout the United States. Often these studies identify new areas of needed research.

Professor Meroney reviewed the Colorado State/Texas Tech Universities (TTU) Cooperative Program in Wind Engineering supported by the National Science Foundation. The program is evaluating and mitigating the effects of severe wind storms on low-rise buildings. Experiments at the TTU field site and in FDDL's wind tunnels are examining external and internal pressures and wind loads under severe thunderstorm, tornado and hurricane wind conditions. This joint effort is examining the economic implications of code improvements, wind engineering, and insurance incentives through surveys and impact analysis programming.

Dr. Bogusz Bienkiewicz, FDDL Professor and member of the Panel's Task Committee "E" on Design for Wind and Wind Hazard Mitigation, reviewed his research in bridge aerodynamics and research being performed at FHWA under a guest researcher assignment. Some of his novel research addresses aerodynamics of racing boats, optimizing human ski positions, and helmet design that reduce drag.

A tour of the FDDL highlighted three wind tunnels. The 12.2 m long test section of the Meteorological Wind Tunnel is capable of independently heating and cooling air to generate thermally stratified flows. The tunnel is used to study flow characteristics of the atmospheric surface layer and to measure wind pressures on buildings and structures. The delegation observed meteorological wind tunnel research on correlated laser light visualization and pressure measurements. FDDL's Industrial Aerodynamic Wind Tunnel's test section is 1.8 m wide by 18.3 m long with adjustable ceiling height ranging from 1.5 m to 2.1 m. A 3 m section of the lower boundary can be heated to 93.3 °C. The Open Circuit Gust Wind Tunnel is equipped with a 3.7 m long test section that is 0.9 m wide and 0.9 m high. A 6-blade fan variable speed motor generates wind speeds ranging from 0.3 m/s to 9.14 m/s. Other FDDL tunnels include the Environmental Wind Tunnel, Thermal Stratification Wind Tunnel, Transpiration Wind Tunnel, and the Separation Wind Tunnel.

FDDL is in the Department of Civil Engineering, Colorado State University, Golden CO.

4. **U.S. Geological Survey** (geohazards.cr.usgs.gov). The delegation was welcomed by Dr. Randall Updike, Chief Scientist, Geohazards Team and Drs. E.V. Leyendecker and Erdal Saffak, and by staff of the Geologic Hazards and National Earthquake Information Center. The delegation was informed of mapping work performed by USGS in Golden, CO. They are developing ground motion maps and national seismic hazard maps for use in the development of U.S. seismic design maps. Also, these maps are used in the regulation of waste disposal sites, highway design, insurance, loss estimation, and damage mitigation. This data is available by CD Roms and maps are available on the Internet. This work forms the basis for the 1997 Recommended Provisions of the National Earthquake Hazards Reduction Program.

A mini-symposium was carried out with Dr. Arthur Tarr, USGS and Dr. Michio Okahara, Director, Bridge and Structures Department, PWRI. Dr. Tarr discussed his work in developing dynamic mapping of earthquake and landslide resources for distribution on the Internet. The soon to be published Internet map technology will permit rapid assessments of specific maps of specific locations. USGS used the January 1994 Northridge earthquake data to test their modeling in the development of the geologic hazards interactive maps for seismic intensity contours in real time. As new information is made available, the maps are automatically recontoured. The system facilitates assessments of damaged structures and buildings.

This work will be a valuable contribution to the Panel's new Task Committee "G" on Seismic Information Systems.

Dr. Michio Okahara discussed PWRI's research, following the January 1995 Kobe earthquake, on seismic retrofit of bridge substructures involving the redesign of reinforced concrete columns. The redesigned columns used base isolators in conjunction with a spiral reinforcements retrofit design. In areas of soil liquefaction, micro-piles were used. This paper is part of the Proceedings of the 30th Joint Meeting of the Panel on Wind and Seismic Effects.
During a review of USGS' National Earthquake Information Center (NEIC) the delegation learned of its mission to provide earthquake information to FEMA and other Federal Agencies, all 50-States, to worldwide scientists and engineers, and the public through the printed and electronic medium. Within 30 minutes following an earthquake, NEIC alerts FEMA and each of the affected States and the media about earthquake severity information, location and magnitude of the earthquake, and earthquake source parameters. This information aids disaster relief officials and scientists in evaluating earthquake hazards. NEIC works closely with the Japan Meteorological Agency and similar other country organizations.

USGS Central Region, Geologic Hazards, is in Golden, CO. The Geologic Hazards Team conducts global investigations of earthquake, geomagnetic, and landslide hazards. The Team consists of eight research groups and three information centers.

5. **Natural Hazards Information Center** (www.colorado.edu/hazards). The delegation was hosted by Dr. Dennis S. Mileti, Center Director and Dr. Mary Fran Myers, Center Co-Director. The delegation was informed of the Center's four key roles:

o Publishes a bimonthly *Natural Hazards Observer* that reaches over 14,000 subscribers. The newsletter features information on disaster issues; hazards research; political and policy developments; world, national, and state program activities; upcoming conferences; and recent publications. Also, the Center produces a semimonthly E-mail newsletter *Disaster Research*.

o Performs in-house research and a grant program enabling "quick response" study of disasters. Recently the Center completed a 6-year study and published its 1,200 page draft final report on *National Assessment of Natural Hazards*. This seminal work was performed through many groups. The latter program permits social scientists to go immediately to the site of a disaster to obtain information that might otherwise be lost. Their findings are subsequently published by the Center in brief Quick Response Reports.

o Hosts an annual workshop, conducted each summer for the past 23 years in Colorado, the workshops bring the public and private sector together to share hazard-related problems and ideas for their solutions. The workshop involves participants ranging from researchers, hazard managers, government officials, professional and nongovernmental organization representatives.

o Maintains a library research services with more than 14,000 books, articles, reports, journals, and other documents on the social, economic, and behavioral aspects of natural disasters. The holdings are cataloged in a computerized, bibliographic database. With this resource, the Center staff responds daily to requests for information from federal, state, and local officials, researchers, members of private and nonprofit organizations, and other concerned individuals around the world.

The Panel is encouraged to use relevant Center services during its planning of Task Committee activities and joint research.

The Center is at the University of Colorado, Boulder. Its goal is to increase communication between hazard/disaster researchers and those individuals, agencies, and organizations that are actively working to reduce disaster damage and suffering. The Natural Hazards Center has a variety of resources available from the Internet.

6. **Pacific Gas and Electric Corporation** (http://www.pge.com/welcome.html). Dr. Lloyd Cluff, Manager, Geosciences Department, reviewed his work assessing earthquake hazards and vulnerability of PG&E's facilities. Dr. Cluff stressed the importance of producing good design for nonstructural elements. Failures of nonstructural elements was the reason for closing PG&E's facilities which did not exhibit exterior structural damages. PG&E is performing a tsunami study to assess damages to PG&E's facilities following a major earthquake on the Juan de Fuga Plate near Eureka, CA. PG&E has appropriated $2 billion for a 15 year to 20 year program to replace gas pipelines and to develop earthquake response planning and post earthquake inspection programs. The PG&E staff involved in earthquake engineering is small; PG&E collaborates with consultants.

The delegation centered their discussions on the restoration of PG&E's four-building headquarters complex following the 1989 Loma Prieta Earthquake and restoration of some powerplants and buildings damaged from the San Fernando and Loma Prieta earthquakes. Eric Elsesser of Forell/Elsesser Engineers, Inc. reviewed his work in seismic restoration/strengthening of PG&E's four-headquarters 1920s vintage buildings' design, restoration, and strengthening following the 1989 Loma Prieta earthquake. The site is on deep bay mud with immersed wooded pile foundations. The original buildings were steel-frame with non-load bearing unreinforced masonry tile infill. The buildings' exterior walls are terra cotta tiles. A variety of structural evaluations and options including demolishing the complex and construct anew were considered before choosing a massive structural shear-wall design as the best solution for rehabilitation. Base-isolation was considered and rejected as a solution. All wood piles were tied to a concrete foundation and into new reinforced walls. The terra cotta tile facade was articulated by cutting the tiles, fastening them to backing brick and setting it in concrete. The building's interiors were gutted, strengthened and repaired, and the infrastructure modernized. The total cost for this work was $180 million. The design and construction costs were $120 million; the remainder represents the costs of disrupting the staff and renting new facilities. A $21 million tax incentive was provided by the State since PG&E maintained the architectural integrity of the building.

PG&E has a $12 million 5-year applied research program with USGS in Menlo Park and with the Pacific Earthquake Engineering Research Center at UC Berkeley that centers on equipment venerability evaluation, building vulnerability, earthquake source characterization, ground deformation and ground motion. Also, PG&E and PEER are working on research to reduce damages following ignition of fires from earthquakes. PG&E's research activities and long-range planning to reduce damages from earthquakes is of much interest to the Panel and for possible collaborative efforts by some Panel's member laboratories.

PG&E headquarters is located in San Francisco. It provides electric service to over 4-million customers (households and businesses) using mixtures of energy resources such as natural gas, hydropower, geothermal and nuclear energy and wind and solar power. Its service area spans 182,000 km^2 within 48 of California's 58 counties, with a population of more than 13 million people. PG&E and other utilities in the state are regulated by the California Public Utilities Commission. PG&E has developed consumer

information on preparing for an earthquake (including design guidelines on bracing your water heater) and preparing for storms. This information is available on the Web at www.pge.com/customer_services/emergency/emerquake.html and at http://www.pge.com/customer_services/emergency/storm.html respectively.

7. **Pacific Earthquake Engineering Research (PEER) Center**
(http://peer.berkeley.edu/html/about_peer.html). Professor Jack P. Moehle, PEER Director hosted the delegation. In Professor's Moehle's overview of PEER, he highlighted current research on performance-based earthquake engineering, response of unsafe concrete bridges, bridge response to ground motions, and safety and reliability of utility systems and lifelines. PEER developed an interactive Web site of research results from searches of experimental results and data. Professor Moehle told us he attended a San Francisco design review meeting, earlier in the morning, to review plans of a 41-story precast moment frame office building that proposes to use the NIST-Pankow developed precast concrete beam-column connection system able to withstand large inelastic deformations due to earthquakes and strong winds.

Three PEER papers were discussed. Dawn Lehman, graduate student, reviewed "Repair of Moderately and Severely Damaged Bridge Columns" an investigation of seismic performance of bridge columns and four-methods of repair that included a mechanical coupler and varying amounts of epoxy injections with and without column jackets. Professor Raymond Seed reviewed his work, "Numerical Modeling and Simulation of Seismic Soil-Pile-Structure Interaction Experiments" on predicting seismic soil-pile-structure interactions under seismic loading from shaking table tests at U.C. Berkeley. Professor Gregory Fenves reviewed, "A Database of Experimental Results on Earthquake Protective Systems Hardware." This on-line database, PROSYS, accesses experimental results from passive protective systems such as seismic isolation and energy dissipation systems, elastomeric and sliding seismic isolators, damping devices, and other active and semi-active response control approaches. The three papers will be published in the Proceedings of the 30th Panel Meeting.

The delegation visited PEER's Earthquake Simulator Laboratory at the Richmond Field Station. The simulator is 6 m by 6 m in plan and configured to produce three cotranslational components of motion._ The simulator can be used to subject structures weighing up to 580 kN to horizontal and vertical ground accelerations up to 1.5 g. The dynamic response, at 25 percent of the shake table capacity, of base isolators to three seismic records: Kobe; Newhall; and El Centro was being evaluated at the time of the visit.

During a visit to the Hayward fault (Berkeley Campus sits atop the Hayward fault), the delegation was informed of a recently developed uniform rating system to evaluate the seismic vulnerability of over 150 Berkeley campus buildings. This work was performed during a 6-month period at a cost of about $200,000. The study identified 50 buildings that were rated poor to resisting seismic loads; they will require an estimated $700,000 to $1 million to retrofit. Berkeley has applied for funding from FEMA and other sources to perform the retrofit. A decision was made that it is more cost-effective to strengthen these buildings than demolish them.

PEER is a national earthquake engineering research center headquartered at UC Berkeley. It was established in 1998 by the National Science Foundation (NSF) and the participating universities and funded by NSF, the State of California, the University of California, the State of Washington, the University of Washington, and business and industry partners. It consists of a consortium of faculty researchers, core universities, and affiliated institutions that conduct programs in research, education and outreach, and information dissemination. PEER supports a business and industry partner program.

8. **California Department of Transportation CALTRANS** (www.dot.ca.gov/). Mr. Thomas Post, Chief, Earthquake Engineering Division, Caltrans and a Panel member hosted the delegation at the Caltrans Oakland facility and later, with the delegation and staff, visited the San Francisco-Oakland Bay Bridge. Mr. Post reviewed the repair and strengthening performed on the San Francisco-Oakland Bay Bridge following the Loma Prieta earthquake. Underway is a $125 million retrofit program to reduce seismic risks to the west section and during the interim period before a new east section is constructed in 2003. The design is to withstand a magnitude 8.0 earthquake of a 1000 year to 2000-year return period. The bridge is retrofitted to remain operational following this design earthquake. As part of the work, Caltrans will be installing 96 dampers (500 K range) in the west section, clamping them from the cable to the main chord. The west section foundations and bents have been strengthened and bracing added to its legs. Friction pendulum isolators were installed at the top of the legs at the lower chord.

Feasibility studies were performed to estimate the costs of fully retrofitting the east section of the bridge versus construction of a new bridge. Cost of the retrofitting is in the $900 million range and of a new east section, cost is estimated at $1.2 billion. A decision was made to construct a new east section. In May 1998, the Metropolitan Transportation Commission (MTC) selected two bridge design options for the east section for further analysis. They are a single tower suspension bridge and a single tower cable-stayed bridge. T.Y. Lin International/Moffatt & Nichol Engineers, the joint-venture architectural and engineering team retained by Caltrans, is developing the designs to the stage of 30% completion so that a final evaluation can be made. When the new bridge is open for traffic in 2003, the old bridge will be dismantled and sold in sections for use by other countries.

The single tower suspension bridge concept will complement the other suspension bridges around the Bay: the Golden Gate, the Richmond-San Rafael bridges, and the western span of the Bay Bridge. The single steel tower will consist of four columns with horizontal link beams to add seismic strength to the tower. The decks are supported by suspending cables attached to a single main cable, which extends above the spine of the span. The suspending cables are attached to the inside of the decks, until near the tower, they traverse to the outside of the decks.

The single tower cable-stayed bridge concept consists of two concrete towers with an elliptical cross-section which gradually tapers toward the top. The two legs are joined by articulated link beams which strengthen the tower's seismic reliability. At the top of the tower, the link beams are protected and enclosed by a "lens." The cables are arranged in a semi-fan pattern and are splayed symmetrically from the central tower to the outside of the decks. This cable arrangement creates a spatial envelope and portal enclosure through which all vehicles and pedestrians pass. The deck is a closed steel box within the cable-supported span and a concrete box girder with ribs at the east viaduct portion of the bridge.

MTC is the transportation planning, coordinating, and financing agency for the nine-county San Francisco Bay Area. Created by the state Legislature in 1970, MTC functions as the regional transportation planning agency, a state designation, and for federal purposes, as the region's metropolitan planning organization. MTC is responsible for the Regional Transportation Plan, a comprehensive blueprint for the development of mass transit, highway, airport, seaport, railroad, bicycle and pedestrian facilities.

Caltrans' headquarters is in Sacramento, CA. They are responsible for the design, construction, maintenance, and operation of the California State Highway System, and that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, Caltrans also is

involved in the support of intercity passenger rail service in California, and is a leader in promoting the use of alternative modes of transportation. The current framework of Caltrans was set down by Assembly Bill 69 in 1972.

9. **San Francisco City Hall Seismic Retrofit** (www.dnai.com/~mbt/projdes/cityhall.html). Mr. Peter Borberg, project manager of Turner Construction and Mr. Paul Rodler, Principal and structural engineer of Forell/Elsesser Engineers, Inc. hosted the delegation to discuss retrofitting the 1915 Beaux Arts San Francisco City Hall. Turner Construction, the general manager of this seismic retrofit project awarded a $103 million lump sum contract to Forell/Elsesser Engineers Inc. Forell/Elsesser is the prime architect/engineer firm performing the seismic retrofit of the 47,983 m^2 building; they are working with the San Francisco Bureau of Architecture who serves as the Executive Architect, and with the City and County of San Francisco. The total cost of seismic upgrade is $181 million and includes $38 million for employee relocation. A Change Order resulting from California's 1997 Proposition A, to upgrade the building's mechanical and electrical systems, extended the original 32-month construction schedule to 44 months. The building will be opened on New Year's Eve 1998.

The structural work is designed to withstand a 475-year magnitude 8 earthquake. The repair work involved: installing a new base isolation system for the entire City Hall building -- 530-1 m diameter rubber-lead core base isolators (designed to 0.5 m displacement) and 66 slider isolators under the ground floor. The building's columns were decoupled from the ground, supported and jacked to permit removal of the lower 1 m of column and set on temporary steel cruciform column supports. The new isolators were installed on a new slab-on-grade and a reinforced mat was built around each column footing. The isolators were tested for 635 mm deflection at 1500 K loading and to 216 mm for properties and quality control. A moat was constructed around the building to accommodate ground shaking. Shear walls, thicker than 1 m were installed in the basement and tied into the floor. A first floor wall system of about 0.7 m thick with a 10 mm thick steel plate extended along the light court up to the roof. Collector beams and new floor bracing were added. Structural strengthening was performed for the rotunda, dome, stairs and elevator shafts.

The architectural work includes new programming and space planning for the entire ground floor; replacing hollow clay tile walls; repairing the interior and exterior stone work; replacing the architectural finishes; and re-attaching stone arches and stone ornaments. The repair design maintained the soft first story to permit for long-vibration displacements. The exterior massive granite stairs were rebuilt with an underlayment stair slider bearing on the ground step. The slider bearing was fabricated of Teflon on stainless steel to allow movement in case of an earthquake. The architectural work emphasizes preservation of the building's historical fabric and significance, bringing the building back to its original architectural finishes, exposing ornamentation and ceilings, opening the two light wells for public use.

The 94 m by 124 m by 124 m height of dome City Hall is listed on the National Register of Historic Places. Its rotunda is a grand interior space and a landmark for the citizens of San Francisco. This City Hall replaced the first city hall which was destroyed in the 1906 San Francisco earthquake.

Following the renovation work, Dr. Hsi-Ping Liu, Structural Engineer from USGS presented USGS' work in instrumenting of selected San Francisco facilities near its four deep bore holes. Data records from these bore holes were used in developing ground shaking amplification mapping.

10. **National Weather Service** (http://www.nws.mbay.net/). The delegation was hosted by Mr.

Charles Morrill, Warning Coordination Meteorologist, National Weather Service (NWS) Forecast Office for the San Francisco Bay Area (located in Monterey). The office issues marine and land weather forecasts and warnings and provides semiweekly water temperature measurements, from Alaska to Mexico, of water skin temperatures from satellites. The information is available on the Web and from other sources. The NWS Climate Diagnostic Center is responsible for providing seasonal climate prediction and for year-to-year climate forecasts. NWS is in the process of upgrading its weather forecasting systems to advance its understanding of how sea temperature in the Pacific affect precipitation over the continental United States.

The delegation discussed research with three researchers offering papers on this topic. Dr. Wendell Nuss, Naval Post Graduate School (NPGS) briefed the delegation on a major 1998 west coast winter storm field experiments. Following the impact of El Nino, NOAA researchers, in collaborating with the U.S. Naval Research Laboratory, are working to improve numerical weather forecast models that will better simulate the present and future states of the atmosphere. These forecasts are in the 36 hour to 48 hour range and will be shared in another NOAA initiative that seeks to improve forecasts in the 0 to12-hour range along the California coast. Improved observations and measurements are sought by measuring vertical profiles of wind, temperature, and moisture in the atmosphere. Measurements will be taken from deployed instrument packages over the Pacific and by aircraft and by satellites.

Dr. Elizabeth Ritchie of the NPGS reviewed her work in developing numerical model studies of typhoon flows over the Japan islands. Modeling is underway at the 1 km range producing finer resolution and understanding the effects of mountains on storms and rainfall. The model is approximating real time weather during the approach and landfall of typhoons.

Dr. Joseph Golden, OAR and co-chair of the Panel's Task Committee on Design for Wind and Wind Hazard Mitigation reviewed new NOAA technologies for forecasting weather. The United States has about 160 new Doppler weather radar stations and about 45 airports use Doppler radars for wind shear warnings. NOAA is working with industry to design instruments to measure wind speed at 100 m/s. They are experimenting with GPS dropsondes and through Doppler-on-wheels to better predict hurricanes before landfall and to model wind. NOAA is seeking new systems to collect wind measures such as: severe storm anemometers; unmanned aircraft to release recorders into storms; and use of appropriate DOD "Star Wars" advanced technologies. NOAA is featuring a global change program with several Federal Agencies and the National Academies of Science and Engineering. They are performing new work in measuring stratospheric ozone depletion and field investigations to characterize ozone losses. NOAA's coastal damage mitigation strategies for hurricanes and other coastal storms include: improve forecasting of 24 hour to 48 hours; reduce required excavation times; provide safe refuges of "last resort"; improve coastal and offshore observations; redirect development in high risk areas; and establish and enforce wind resistant building codes (the latter by working with NIST).

The mission of the National Weather Service is to provide weather and flood warnings, public forecasts and advisories for all of the United States, its territories, adjacent waters and ocean areas, primarily for the protection of life and property. NWS data and products are provided to private meteorologists for the provision of all specialized services. OAR is the principal weather and space weather research arm of NOAA and works synergistically with the NWS.

Noel J. Raufaste, Secretary-General
U.S.-side Panel on Wind and Seismic Effects

ABSTRACT

This publication is the Proceedings of the 30th Joint Meeting of the U.S.-Japan Panel on Wind and Seismic Effects. The meeting was held at the National Institute of Standards and Technology, Gaithersburg, Maryland, during 12-15 May 1998. The Proceedings include the agenda, list of Panel members, Panel Resolutions, the 45 technical papers written for this joint meeting, and the Panel's 11-Task Committee Reports.

Thirty-nine oral presentations centered on seven themes: 1. Special Session in Celebration of the Panel's 30th Anniversary, 2. Storm and Surge Tsunamis, 3. Earthquake Engineering, 4. Joint Cooperative Research Programs, 5. Real Time Information Acquisition and Dissemination, 6. Wind Engineering and 7. Reviews of the Panel's 11-Task Committee Activities and Highlights of Recent Task Committee Workshops. The Panel provides the vehicle to exchange technical data and information on design and construction of civil engineering lifelines, buildings, water front, and coastal structures. Panel findings continue to influence ongoing structural engineering research and contribute to the revision and creation of U.S. and Japanese building codes and standards.

KEYWORDS: Bridges; building technology; concrete; design criteria; disaster reduction; earthquakes; geotechnical engineering; GPS, ground failures; lifelines; liquefaction; risk assessment; seismic; shaking table; standards; storm surge; structural engineering; tsunamis; and wind loads.

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THEME: EARTHQUAKE ENGINEERING

MANUSCRIPTS PRESENTED at MINI-SYMPOSIUM

U.S.-side Presentation addressed the U.S. Geological Survey development of ground motion maps and siesmic intensity contours that will be available on the Internet. (No manuscript available).

MANUSCRIPTS AUTHORED for PANEL MEETING but NOT PRESENTED ORALLY

AGENDA
30th JOINT MEETING
PANEL on WIND AND SEISMIC EFFECTS
12-15 May 1998

Sunday 10 May
Delegation Arrives

Monday 11 May
Technical Visits, Army Topographic Engineering Center and National Building Museum

Tuesday 12 May

0925 Meet in Lobby of Holiday Inn for NIST Shuttle to Administration Building
0930 Travel by bus to NIST

WIND AND SEISMIC EFFECTS FOR THE NEW MILLENNIUM

1000 OPENING CEREMONIES
(Employees Lounge, NIST Administration Building)

Call to order by Noel J. RAUFASTE, Secretary-General US-side Panel

Opening remarks by Raymond KAMMER, Director, National Institute of Standards and Technology

Remarks by Takao KURAMOCHI, Counsellor for Science and Technology, Embassy of Japan

Remarks by Richard N. WRIGHT, Chairman US-Side Panel on Wind and Seismic Effects, and Director, Building and Fire Research Laboratory

Remarks by Yasutake INOUE, Chairman Japan-Side Panel on Wind and Seismic Effects, and Director-General, Public Works Research Institute

Introduction of U.S. Members by U.S. Panel Chairman

Introduction of Japan Members by Japan Panel Chairman

Elect Joint Meeting Chairman

Adopt Agenda

1120 **Break**

SPECIAL SESSION TO CELEBRATE THE PANEL'S 30TH ANNIVERSARY

1140-1240 THEME 1 -- SPECIAL SESSION IN CELEBRATION OF THE PANEL'S 30TH ANNIVERSARY

Chairman: Mr. Yasutake INOUE

1140 Natural Disasters and Protective Measures in Japan, Yasutake INOUE* PWRI
1200 Completing our Panel's Work, Richard N. WRIGHT*, NIST
1220 Discussion
1240 **Adjourn**

1245 **Group Photograph**

1300 **Lunch: Hosted by** Raymond KAMMER, Director, National Institute of Standards and Technology, NIST Lunch Club

THEME 2 - STORM SURGE AND TSUNAMIS

1400-1500 Technical Session - STORM SURGE AND TSUNAMIS

Chairman: Mr. Yasutake INOUE

1400 Tsunami and Storm Surge Characteristics Based on Long-Term Tide Observations, Toshihiko NAGAI, Kazuteru SUGAHARA, Hiroshi WATANABE, Koji KAWAGUCHI, PHRI, Masahiro MIHARA, ECHO Corporation and Katsumi TAKASHIMA, Coastal Ocean Research Corporation. Presented by Shigetoshi KOBAYASHI* PWRC
1420 International Responses to Pacific Tsunami Warnings and Watches, Mike BLACKFORD*, NOAA
1440 Discussion
1500 **Break**

* denotes presenter

TASK COMMITTEE MEETINGS

1515-1700 **Task Committee Meetings**

T/C A **Strong-Motion Data and Applications**, BFRL Conf. Room B-317, Bldg. 226
Dr. Susumu IAI (Japan-side Chair) and Dr. Roger BORCHERDT (U.S.-side Chair)

T/C B **Testing and Evaluation Procedures for Building Systems**, BFRL Conf. Room B-221, Bldg 226
Mr. Keiichi OHTANI (Japan-side Chair) and Dr. H.S. LEW (U.S.-side Chair)

T/Cs C & G **Design Evaluation and Improvement of Structures** and **Structural Control and Intelligent Material Systems**, Admin. Bldg. NIST Employees Lounge
Dr. Hisahiro HIRAISHI (Japan-side Chair) and Dr. Ken CHONG (U.S.-side Chair)
Dr. Jun-ichi HOSHIKUMA (Japan-side Acting Chair) and Dr. Shi-Chi LIU (U.S.-side Chair)

T/C D **Earthquake Engineering for Dams**, BFRL Conf. Room A-368, Bldg. 226
Mr. Takashi SASAKI (Japan-side Acting Chair) and Dr. Robert HALL (U.S.-side Chair)

T/C E **Design for Wind and Wind Hazard Mitigation**, BFRL Conf. Room B-245 Bldg 224
Dr. Hiroshi SATO (Japan-side Chair) Dr. Joseph GOLDEN (U.S.-side Chair)

T/C F **Disaster Prevention Methods for Lifeline Systems**, ITL Conf. Room B-111 Bldg 225
Dr. Keiichi TAMURA (Japan-side Acting Chair) and Dr. Riley CHUNG (U.S.-side Chair)

1700 **Conclusion of Day 1**

1700 Depart NIST by bus to Holiday Inn

U.S.-side Panel Hosted Reception

1745 Bus depart Holiday Inn for residence of Dr. and Mrs. Charles SMITH for 30th Joint Panel Celebration
2200 Adjourn and, by bus, return to hotel
2245 Arrive at hotel

Wednesday 13 May

0740 Meet in lobby of Holiday Inn for NIST Shuttle Bus to Administration Building
0745 Travel by bus to NIST

THEME 3 - EARTHQUAKE ENGINEERING

0830-1230 Technical Session - Earthquake Engineering Part 1

Chairman: Dr. Richard WRIGHT

0830 Real-Time Hybrid Vibration Experiments with a 2-Degrees-of-Freedom Model, Keiichi TAMURA* and Hiroshi KOBAYASHI, PWRI
0850 A Vision for the Future of Strong-Motion Recordings, Roger BORCHERDT*, USGS
0910 Project on 3-D Full-Scale Earthquake Testing Facility -First Report, Keiichi OHTANI*, Tsuneo KATAYAMA and Heki SHIBATA, NIED
0930 Discussion
0950 Strong Motion from Surface Waves in Deep Sedimentary Basins, William JOYNER*, USGS
1010 Performance Based Design for Port Structures, Susumu IAI* and Koji ICHII, PHRI
1030 Analysis of Sea Floor Earthquake Data, Charles SMITH*, MMS and David BOORE, USGS
1050 Discussion
1110 **Break**

1130 Effect of Reservoir-Subbottom Energy Absorption on Hydrodynamic Forces on Dams, Robert HALL*, Louis de BEJAR, Keith SJOSTROM, and Enrique MATHEW, WES
1150 A Study on Stress in Concrete Gravity Dams Using Seismic Data During Kobe Earthquake, Takashi SASAKI*, Tsuneo UESAKA and Isao NAGAYAMA, PWRI
1210 Seismic Analysis of Hoover Dam, by Larry NUSS, BUREC
1230 Discussion
1250 **Adjourn for Lunch**

1300 **Lunch: Hosted by** Dr. William ANDERSON, Hazard Reduction Program, Civil and Mechanical Infrastructure Systems Division, National Science Foundation, NIST Lunch Club

1400-1500 Technical Session - Earthquake Engineering (Continued)

Chairman: Dr. Richard WRIGHT

1400 Development and Operation of Large Centrifuge at PWRI, Osamu MATSUO, Tatsuya TSUTSUMI, Mitsu OKAMURA*, Tetsuya SASAKI, PWRI and Kunio NISHI, Hazama Corporation

1420 The Influence of Continuing Stress on Liquefaction Resistance, Mary Ellen HYNES*, WES

1440 Evaluation of the Seismic Capacity of an Existing Thick Wall Reinforced Concrete Structure using Probabilistic Criteria by Frederick LOCEFF, George RAWLS, and Greg MERTZ*, DOE

1500 Discussion

1520 **Break**

TASK COMMITTEE MEETINGS

1535-1715 Task Committee Meetings

T/C H **Soil Behavior and Stability During Earthquakes**, Admin. Bldg., NIST Employees Lounge
Dr. Mitsu OKAMURA (Japan-side Chair) and Dr. Mary Ellen HYNES, U.S.-side Chair)

T/C I **Storm Surge and Tsunamis**, BFRL Conf. Room A-368, Bldg. 226
Dr. Shigetoshi KOBAYASHI (Japan-side Acting Chair) and Mr. Michael BLACKFORD (U.S.-side Chair)

T/C J **Wind and Earthquake Engineering for Transportation Systems**, BFRL Conf. Room B-221 (Bldg. 226)
Dr. Michio OKAHARA (Japan-side Acting Chair) and Dr. Phillip YEN (U.S.-side Acting Chair)

T/C K **Wind and Earthquake Engineering for Offshore and Coastal Facilities**, Admin. Bldg. BFRL Conf. Room B-245, Bldg. 224
Dr. Susumu IAI (Japan-side Acting Chair) and Dr. Charles SMITH (U.S.-side Chair)

New T/C **Seismic Information Systems**, BFRL Conf. Room B-317, Bldg. 226
Mr. Takaharu KIRIYAMA and Dr. Hideki SUGITA (Japan-side Preliminary Co-Chairs) and Dr. William ROPER and Mr. Stuart NISHENKO (U.S.-side Preliminary Co-Chairs)

1715 **Conclusion of Day 2**

1720 Depart NIST by NIST van and Holiday Inn van to Holiday Inn

1745	Travel by NIST bus to the National Academy of Sciences
1830	U.S.-side hosted dinner at Members Room, NAS
2100	Return by bus to Holiday Inn by sightseeing portions of Washington, DC .

Thursday 14 May

0740 Meet in Lobby of Holiday Inn
0745 Travel by bus to NIST

THEME 3 - EARTHQUAKE ENGINEERING - PART II

0820-1140 Technical Session - Earthquake Engineering-Part II

Chairman: Mr. Yasutake INOUE

0820 Development of an Analysis of Structural Steel Fracture and Development of Technical Solution, Hiroyuki YAMANOUCHI, Akiyoshi MUKAI* and Takashi HASEGAWA, BRI
0840 Design Guidelines for the Seismic Modification of WSME Buildings, John GROSS*, NIST
0900 Draft Manual for Seismic Isolation Design of Underground Structures, Shigeki UNJOH, Jun-ichi HOSHIKUMA*, Kazuhiro NAGAYA and Kazuhiko MURAI, PWRI
0920 Comparison Between Affected Populations of Indirect Health Effects after the 1995 Great Hanshin-Awaji Earthquake, Keiko OGAWA*, Ichirou TSUJI, Shigeru HISAMICHI, Tohoku University and Keishi SHIONO, Nagaoka Technology College
0940 Discussion
1000 **Break**

1020 New Framework for Performance-Based Design of Building Structures-Design Flow and Social System, Hisahiro HIRAISHI*, Masaomi TESHIGAWARA, Hiroshi FUKUYAMA, Taiki SAITOH, Wataru GOJO, Hideo FUJITANI, Yuji OHASHI, Izuru OKAWA and Hisashi OKADA, BRI
1040 Highway Bridge Seismic Design: How Current Research May Affect Future Design Practices, Ian FRIEDLAND, NCEER, W. Phillip YEN*, FHWA, Ronald L. MAYES, DIS, and John D. O'FALLON, FHWA
1100 Development of Performance-Based Design Building Code in Japan-Framework of Structural and Seismic Provisions, Hisahiro HIRAISHI*, Mitsumasa MIDORIKAWA, Masaomi TESHIGAWARA and Wataru GOJO, BRI
1120 Discussion
1140 **Break**

THEME 4 - SUMMARY RECENT PANEL WORKSHOPS

Chairman: Mr. Yasutake INOUE

1200-1255 **Workshop Reports**

1200 **Task Committees B&C**, 4th U. S.-Japan Technical Coordinating Committee Meeting on Composite and Hybrid Structural Systems, 12-14 October 1997, Monterey, CA, USA. (Presented by Hisahiro HIRASHI, BRI)

1210 **Task Committee E**, 1st Workshop on Design for Wind and Wind Hazard Mitigation, 7-9 October 1997, East-West Center, University of Hawaii, HI, USA. (Presented by Joseph GOLDEN, NOAA)

1220 **Task Committee F**, 7th Workshop on Earthquake Disaster Prevention for Lifeline Systems, 4-5 November 1997, Seattle, WA USA. (Presented by Keiichi TAMURA, PWRI)

1230 **Task Committee J**, 13th Bridge Workshop, 2-3 October 1997, Tsukuba Japan. (Presented by Phillip YEN, FHWA)

1240 Discussion

1255 **Adjourn for lunch**

1300 **Lunch: Hosted by** Michael ARMSTRONG, Associate Director, Mitigation Directorate, Federal Emergency Management Agency

THEME 5 - REAL TIME INFORMATION ACQUISITION AND DISSEMINATION

Chairman: Mr. Yasutake INOUE

1400-1720 **Technical Session - Real Time Information Acquisition and Dissemination**

1400 American Red Cross/CDC Health Impact Surveillance System for Natural Disasters, Enrique PAZ-ARGANDONA* and Josephine MALILAY, CDC

1420 Development of the Disaster Information System (DIS/Earthquakes), Kazuo OKAYAMA, Takaharu KIRIYAMA*, and Seishi YABUUCHI, NLA

1440 Recent FEMA Activities in Earthquake Risk Analysis and Mitigation, Stuart NISHENKO* and Gil JAMIESON, FEMA (with a demonstration of HAZUS during the break)

1500 Seismic Information System for Civil Infrastructures, Hideki SUGITA*, Tomofumi NOZAKI and Tadashi HAMADA, PWRI

1520 Discussion

1540 **Break**

1600 New Developments in Seismic Risk Analysis for Highway Systems, Stuart D. WERNER Seismic Systems & Engineering Consultants, Craig E. TAYLOR, Natural Hazards Management Inc., James E. Moore II, University of Southern California, and John B. MANDER, State University of New York at Buffalo, John B. JERNIGAN, Ellers, Oakley, Chester & Rike & Howard H.M. HWANG, Univ. of Memphis

1620 Devastation Network in Miura Peninsula, Japan, Makoto WATABE*, Keio University and Satomi HIROKAWA, Yokosuka City

1640 Geospatial Analysis Support to Natural Disasters, William ROPER*, CORPS

1700 Discussion

1720 **Conclusion of Day 3**

1725 Return to hotel by van

1800 Individual hosted dinners

Friday 15 May

0735 Meet in Lobby of Holiday Inn
0740 Travel by bus to NIST

THEME 6 - WIND ENGINEERING

Chairman: Dr. Richard WRIGHT

0800-1040 Technical Session - Wind Engineering

0800 Analysis of Wind and Wind Effects Revisited - A Case Study of Deer Isle-Sedgwick Bridge, D.W. MARSH and B. BIENKIEWICZ, CSU and Harold BOSCH, FHWA
0820 Next Generation Trans-Strait Road Projects and the State of Technology Development, Michio OKAHARA* and Masahiro NISHITANI, PWRI
0840 New Hurricane Wind Structures and Wind Speed Measurements, Peter BLACK* and Frank MARKS, NOAA
0900 Discussion
0920 Consideration on Flutter Characteristics of Super Long-Span Bridges, Hiroshi SATO*, Katsuya OGIHARA and Ken-ichi OGI, PWRI
0940 Structural Control Research in the U.S. for Wind and Earthquake Loading, M. P. SINGH*, VPI and T.T. SOONG, State University of NY-Buffalo
1000 Wind and Seismic Research for Improved Engineering Consensus Standards and Housing Construction, Jay CRANDELL*, NAHBRC and William FREEBORNE, HUD
1020 Discussion
1040 **Break**

THEME 7 - SUMMARY JOINT COOPERATIVE RESEARCH PROGRAMS

Chairman: Dr. Richard WRIGHT

1100-1200 Technical Session - Joint Cooperative Research Programs

1100 U.S.-Japan Cooperative Earthquake Engineering Research Program on Composite and Hybrid Structures -Japan Side Plans and Accomplishments, Isao NISHIYAMA, Hiroyuki YAMANOUCHI and Hisahiro HIRAISHI (Building Research Institute) Presented by Akiyoshi MUKAI*, BRI
1120 U.S.-Japan Cooperative Earthquake Engineering Research Program on Composite and Hybrid Structures -- U.S.-side Progress, Subhash Goel, Subhash GOEL*, University of Michigan
1140 Discussion
1200 Break

TASK COMMITTEE REPORTS AND RESOLUTIONS

1215-1255 **Report of Task Committees**

Chairman: Dr. Richard WRIGHT

T/C A	Strong-Motion Data and Applications
T/C B	Testing and Evaluation Procedures for Building Systems
T/C C	Evaluation and Improvement of Structures
T/C D	Earthquake Engineering for Dams

1255 **Adjourn for Lunch**

1300 **Lunch: Hosted by** Dr. John FILSON, Acting Coordinator, Earthquake Hazard Program, US Geological Survey, NIST Lunch Club

1400-1520 **Report of Task Committees (Continued)**

T/C E	Design for Wind and Wind Hazard Mitigation
T/C F	Disaster Prevention Methods for Lifeline Systems
T/C G	Structural Control and Intelligent Materials Systems
T/C H	Soil Behavior and Stability During Earthquakes
T/C I	Storm Surge and Tsunami
T/C J	Wind and Earthquake Engineering for Transportation Systems
T/C K	Wind and Earthquake Engineering for Offshore and Coastal Facilities
New T/C	Seismic Information Systems

1520-1535 **Break**

1535-1620 **Adoption of Final Resolutions**

1620-1630 **Break**

CLOSING CEREMONIES

1630 Call to Order by Noel J. RAUFASTE, Secretary-General, U.S.-Side Panel

Closing Remarks by Yasutake INOUE, Chairman Japan-Side Panel

Closing Remarks by Richard N. WRIGHT, Chairman U.S.-Side Panel

1650 Conclusion of 30th Joint Panel Technical Sessions

1655 Depart NIST by bus to Holiday Inn

1800 Depart Holiday Inn by Bus
1900 Japan-side hosted dinner
2130 Return to hotel by bus

LIST OF PANEL MEMBERS

30th JOINT PANEL MEETING
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May 1998

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RESOLUTIONS

RESOLUTIONS OF THE THIRTIETH JOINT MEETING U.S.-JAPAN PANEL ON WIND AND SEISMIC EFFECTS (UJNR)

National Institute of Standards and Technology, Gaithersburg, MD
12-15 May 1998

The following resolutions are hereby adopted:

1. The Thirtieth Joint Panel Meeting provided the forum to exchange valuable technical information that is beneficial to both countries. In view of the importance of cooperative programs on the subject of wind and seismic effects, the continuation of Joint Panel Meetings is considered essential.

2. The following activities have been conducted since the Twenty-Ninth Joint Meeting:

   a. Technology Exchanges. Technical experts, technical documents, and applications of the electronic media have been exchanged. These exchanges have contributed to the development of new research programs and enhanced ongoing research in both countries.

   b. Task Committee Workshops. The Panel held four workshops/committee meetings and technical site visits; more than 200 specialists from both countries participated in these activities:
      1. Task Committees (B&C), 4th U. S.-Japan Technical Coordinating Committee Meeting on Composite and Hybrid Structural Systems, 12-14 October 1997, Monterey, CA, USA.
      2. Task Committee (E), 1st Workshop on Design for Wind and Wind Hazard Mitigation, 7-9 October 1997, East-West Center, University of Hawaii, HI, USA.
      3. Task Committee (F), 7th Workshop on Earthquake Disaster Prevention for Lifeline Systems, 4-7 November 1997, Seattle, WA, USA.
      4. Task Committee (J), 13th Bridge Workshop, 2-3 October 1997, Tsukuba, Japan.

   c. Common Agenda. The Panel recognizes the importance of providing earthquake science and technology expertise to the 17 April 1996 U.S.-Japan Natural Disaster Reduction Initiative of the U.S.-Japan Framework for New Economic Partnership (Common Agenda). Panel members organized and participated in the Second Earthquake Policy Symposium (EPS), 17-19 September 1997, Kobe, Japan and reviewed over 40-proposals for the Earthquake Disaster Mitigation Partnership (EDMP). The Panel will continue to provide in close cooperation with EDMP technical leadership and participation in the next EPS phase -- First High-Level Forum Meeting that will address three themes: 1. Development and Use of Real-Time Seismic Information Systems; 2. Development and Use of Loss Estimation Models; and 3. Post-Earthquake Response and Recovery Policies. Appropriate Task Committees will respond to the Common Agenda in planning their work.

3. The Panel approved the consolidation of Task Committees (C) and (G) into Task Committee (C). The Panel approved the establishment of a new Task Committee on Seismic Information Systems T/C (G).

4. The Panel will continue to seek methods to contribute to the International Decade for Natural Disaster Reduction (IDNDR) such as disseminating Proceedings of Joint Panel Meetings and of Task Committee Workshops to appropriate organizations of the IDNDR.

5. The Panel approved the Task Committee reports presented during the 30th Joint Panel Meeting. Each report included objectives, scope of work, accomplishments, future plans, and other information. The Panel will continue to review the Task Committees' progress toward meeting their objectives; consolidating, eliminating, and/or creating Task Committees as desirable.

6. The Panel endorses the following ten (10) proposed Task Committee Workshops/Committee Meetings during the coming year:
   a. Task Committee (A), Workshop on Soil-Structure Interaction, September 1998 in USA.
   b. Task Committee (B),1st Workshop on Test Procedure, Documentation, Retrieval of Test Data, and Experimental Facilities, 1999, location to be determined.
   c. Task Committee (B&C), 5th U.S.-Japan Technical Coordinating Committee Meeting on Composite and Hybrid Structural Systems, October 1998, Japan.
   d. Task Committee (B&C), 20-year Commemoration Symposium on Cooperative Earthquake Engineering Research, October 1998, Tokyo.
   e. Task Committee (C), Workshop on Smart Structural Systems, May 1998, Sonoma, CA, and Fall 1998, (to be determined), USA.
   f. Task Committee (D), 2nd Workshop on Earthquake Engineering for Dams, in conjunction with the 31st Joint Panel Meeting, May 1999, Japan.
   g. Task Committee (E), 2nd Workshop on Design for Wind and Wind Hazard Mitigation, Fall 1998, Japan.
   h. Task Committee (H), Workshop on Soil Dynamics Studies by Centrifuge, 28-29 September 1998, Tsukuba, Japan.
   i. Task Committee (I), 5th Tsunami Workshop, July 1998, Sapporo, Japan.
   j. Task Committee (J), 14th Bridge Workshop, November 1998, Pittsburgh, PA .

   Scheduling for the Workshops will be done by the U.S. and Japan Chairmen of the respective Task Committees with concurrence of the Joint Panel Chairmen. Both sides' Secretaries-General will be kept informed of the planning. Results of each activity conducted before the 31st Joint Meeting will be presented at the 31st Joint Panel Meeting.

7. The Panel recognizes the importance of continuing its joint research programs on Soil Liquefaction and Countermeasures and on Smart Structural Systems.

8. The Panel recognizes the importance of conducting research in the area of public health following natural disasters and recommends the subject be featured in the 31st Joint Panel Meeting.

9. The Panel will seek methods to contribute to the International Organization for Standardization (ISO) through participation of its members and related agencies in appropriate ISO Technical Committees.

10. The Panel published its fifth newsletter issue, *Wind and Seismic Effects*, Winter 1998. The newsletter featured articles on the 29th Joint Panel Meeting; the 2nd U.S.-Japan Earthquake Policy Symposium; the 1st U.S.-Japan Workshop on Design for Wind and Wind Hazard Mitigation; highlights of new Japanese laboratory facilities following the Kobe Earthquake; and a highlight of the National Research Institute for Earth Science and Disaster Prevention and the U.S. Geological Survey. The Panel endorses continuing the publication of the Panel's newsletter. The U.S.-side will publish the sixth newsletter during the winter of 1998-99.

11. The National Institute of Standards and Technology (NIST) will maintain the Panel's Web Site on an interim basis. The five Panel newsletters were added to the Web Site. The Panel encourages all members from both sides to use electronic media, as much as possible, in communicating Panel findings and summaries of its activities. The Web Site URL address is: http://www.bfrl.nist.gov/info/ujnr/ujnr1.html.

12. The Panel recognizes the importance of continued exchange of personnel, technical information, research results, and recorded data that lead to mitigating losses from strong winds and earthquakes. The Panel also recognizes the importance of using available large-scale testing facilities and other complementary capabilities in both countries. Thus, these activities should be continued, strengthened, and expanded. The Panel will provide official endorsement to facilitate these exchanges.

13. Thirty-First Joint Panel Meeting of the UJNR Panel on Wind and Seismic Effects will be held at the Public Works Research Institute, Tsukuba, Japan in May 1999. Specific dates, program, and itinerary will be proposed by the Japan-side with concurrence of the U.S.-side Panel.